

WHAT IS CLAIMED IS:

1. An apparatus for insufflating a treating gas into the nose of a patient and measuring carbon dioxide content in the exhalation of the patient, said apparatus consisting of:

an elongated hollow body including a tubular portion adapted to be received on the skin surface adjacent the nose;

a wall within said hollow body defining therein both an inhalation manifold and an exhalation manifold, said wall providing a gas-tight seal positively preventing fluid communication between said inhalation and exhalation manifolds;

supply means for connecting said inhalation manifold to a supply of treating gas;

a first hollow prong in fluid communication with said inhalation manifold and adapted to be received in a first nasal passage of the nose for insufflating said treating gas into the nose;

a second hollow prong in fluid communication with said exhalation manifold and adapted to be received in a second nasal passage of the nose for withdrawing a portion of the exhalation therefrom, said prongs each being substantially smaller in diameter than the respective nasal passages, so as not to occlude said passages; and

at least said second prong being provided with at least one additional opening communicating with the hollow interior of said second prong and said exhalation manifold; and

means for measuring the concentration of carbon monoxide in the exhaled gases said means including means for withdrawing an exhaled gas sample from said exhalation manifold.

2. A method for monitoring end tidal  $\text{CO}_2$  in unintubated, conscious, spontaneously breathing patients who are receiving administration of local and regional anesthesia or during recovery from residual general anesthesia consisting of the steps of:

providing a nasal cannula on a patient, said cannula having an elongated hollow body; a gas-tight partition in said hollow body to divide said hollow body into a first zone and a second zone separated from each other by said gas tight partition; gas supply means including first conduit means communicating with said first zone and a source of oxygen, second conduit means communicating with said second zone and communicating with a means for detecting and measuring the partial pressure of carbon dioxide in the exhaled gases said elongated hollow body in addition containing separate hollow nasal prongs each communicating with one of said first and second zones and with respectively each nostril of the patient;

supplying oxygen to said patient from said source of oxygen through said first conduit means to said first zone of said elongated hollow body and into the patient's nostril through one of said nasal prong means;

withdrawing exhaled breath containing carbon dioxide from said patient through the other of said nasal prongs into said second zone of said elongated hollow body, through said second conduit means and into said means for detecting and measuring the partial pressure of carbon dioxide; and

determining the partial pressure of carbon dioxide at the end of the patient's exhalation to obtain a clinical approximation of the partial pressure of arterial carbon dioxide, wherein the other of said hollow nasal prongs is provided with an opening in addition to the diameter of the opening of said nasal prong and sized to prevent the withdrawing of exhaled breath from causing occlusion of

said hollow nasal prong by adjacent tissue or patient secretions.

3. A nasal cannula comprising a face piece consisting of an elongated hollow body terminating at both ends in tubular cross section portions, two hollow nares communicating with the interior of said hollow body protruding in parallel from positions adjacent the center of the hollow body and spaced apart a sufficient distance and each of sufficient length for the open terminus of said nare to be received in or adjacent to the nostrils of a patient, and a fluid tight wall located between the hollow nares inside of the hollow body to prevent fluid communication between the nares inside of the hollow body,

at least one of said nares being provided with at least one opening other than the opening into the hollow body or the opposite terminus of said nare, said opening being sized to prevent suction applied to said nare from a carbon dioxide analyzer from drawing the open terminus of said nare onto the adjacent tissue of the patient's nostril whereby the nare would become occluded and located sufficiently near the terminus of said nare to receive exhalation gases substantially undiluted by atmospheric gases during sampling by a carbon dioxide analyzer.

4. A system for insufflating a treating gas into the nose of a patient and for measuring the carbon dioxide concentration of the patient's exhaled breath consisting of:

a source of insufflating gas;

first conduit means connected to and in intermittent fluid communication with said source of insufflating gas;

cannula means connected to said first conduit means and in fluid communication with said source of insufflating gas and at least one nostril of a patient;

means for drawing a portion of the patient's exhaled gases and measuring the concentration of carbon dioxide in the patient's exhaled gases;

second conduit means connected to and in fluid communication with said drawing and measuring means, said second conduit means being connected to said cannula means and in fluid communication with at least one other nostril of a patient whereby the gas delivery occurs only after the peak carbon dioxide concentration is measured in each breath exhalation cycle; and

wherein said cannula means includes multiple fluid communication means for means in communication with said drawing and measuring means.

5. The system of claim 4 wherein the cannula means includes at least two hollow nares each one of said two hollow nares only in fluid communication with either said source of gas or said drawing and measuring means.